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Single radar reflector from fabric change at EPCIA DML drill site

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We observe a strong continuous radar reflector in airborne radio-echo sounding data at the EPICA deep-drilling site in Dronning Maud Land, Antarctica. The reflector occurs at a depth of about 2020-2030 m and is observed with a 60 ns and 600 ns long pulse at a frequency of 150 MHz. The conductivity profile of the EPICA ice core shows a number of distinctive peaks, probably of volcanic origin. Because of high background noise, the permittivity profile does not show prominent signals at these depths. Application of numerical forward modelling of electromagnetic wave propagation, based on conductivity profiles from the EPICA ice core, is able to reproduce nearby reflections, but fails to reproduce this reflector. However, near the estimated depth of origin, the distribution of crystal c-axes, the fabric, shows a dominant change from a girdle-type to increased single-pole orientation. We therefore interpret the observed reflector to originate from this change in crystal fabric. Our observations allow to spatially extrapolate the crystal orientation feature along the reflector, with implications for ice-sheet evolution, e.g. as considered by dynamic modelling.